lies hid. The attacks upon it from the direction of physical chemistry and physiological morphology, of irritability, of ecology, and of cytology, are the concentrating attacks of various divisions of an army upon a citadel, some of whose outer defences have already been captured. The innumerable observations are devised along parallel lines of approach, and each division of the army is creeping closer and closer to the inner defences, which yet resist all attacks and hide the long-sought truth. We see yet no breach in the citadel. Here and there we seem to approach more closely and at certain points are getting glimpses, through this loophole or that, of inner truths, hidden before.

One outer circle of defences yet remains untaken, and until that falls it would seem that there is little hope of capturing the inner citadel. We *must* know more of the constitution of dead substances chemically related to the living ones. When the students of chemistry can put the physiologists into possession of the facts regarding dead proteids we shall renew the attacks more directly, with greater vigor and greater hope of success.

That ultimate success is to crown our efforts there is little reason to doubt. Ten years ago we little dreamed of the tremendous strides as since made toward the interpreting of life's central truth. The success of the past is the best augury for the future. The brilliant researches upon the chemistry of carbon compounds inspire us with renewed hope and put into our hands almost daily new weapons.

It is not possible to prove to-day that life and death are only a difference in the chemical and physical behavior of certain compounds. It is safe to say that the future is likely to justify such an assertion. In the meanwhile we press forward along the whole line. Botany is more than ever full of meaning, because with its sister sciences it is no longer seeking things, but the reasons for things.   CHARLES R. BARNES.

UNIVERSITY OF CHICAGO.

SECTION A—ASTRONOMY AND MATHEMATICS.

THE address of Vice-President Alexander Macfarlane entitled ' The Fundamental Principles of Algebra,' and the ' Report on Progress in Non-Euclidean Geometry,' by Professor George Bruce Halsted, of the University of Texas, are both to be published in full in SCIENCE and will not be treated further here.

A Report on the Recent Progress in the Theory of Linear Groups, presented by Professor L. E. Dickson, of the University of California, was of the nature of a supplement to the report on finite groups, read at the last annual meeting of the Association, by Dr. G. A. Miller, of Cornell. It is intended for publication in the *Bulletin of the American Mathematical Society*, in which the report of Dr. Miller appeared last year.

Part I. of the present report gives the general theorems relating to the canonical form of finite groups of linear substitution and to the generators of such groups. After a complete enumeration of the binary and ternary collineations in their historical setting, a number of special quaternary linear groups, particularly the famous one of order 51,840, are considered.

Part II. treats of linear groups in a Galois field, their order, generators, factors of composition and the isomorphisms existing between them. The Galois field is defined and a full bibliography added. The general linear homogeneous group, the linear fractional group, the Abelian linear group and its generalized form, the first and second hypoabelian groups, the orthogonal group, other linear groups with a quadratic invariant or a special invariant of degree q, the hyperorthogonal group and the hyperabelian group are all treated in turn. A number of

isomorphisms existing between these groups are tabulated. As many as six forms of a single group of order 25,920 are given, this group having applications in various geometric problems.

Professor Asaph Hall, Jr., of the University of Michigan, communicated to the Section certain results of a series of observations of the meridianal zenith of Polaris made by him between May, 1898, and July, 1899, with a view to determining the latitude variation at Ann Arbor and the aberration constant. The observations were made above and below the pole, both direct and reflected. The direct observations, at upper and lower culmination, respectively, give the values for the aberration constant $20''.60$ and $20''.58$, and for the parallax $0''.32$ and $0''.29$. The reflected observations show a close agreement with the direct observations. The observations are being continued.

A paper entitled ' Ancient Eclipses and Chronology ' was presented by R. W. Mac-Farland, of Oxford, O. It is, in the main, a critical examination of the sources in ancient history from which the commonly accepted dates of various events are determined, and especially such sources as involve references to eclipses. The author of the paper reaches the conclusion that in each case examined the historical statement connecting a specified important event with an eclipse is either inadequate to establish accurately the relation of the two in time or else that the computations of the astronomers of the present day are not of sufficient accuracy to fix the eclipse in question within several years of the truth.

Professor H. C. Lord, of the Ohio State University, gave an interesting account of an investigation in which he has lately been engaged as to the best relative dimensions for different parts of a spectroscope which is to be used photographically, not visually. His account was fully illustrated by photographs and tables of results. He insisted especially upon certain advantages to be gained by using a camera of considerable focal length rather than one of short focus.

The proof of Grassmann's fundamental theorem, that there can be but two kinds of lineal multiplication of two factors, is somewhat long and rather difficult to follow. The object of the paper presented by Mr. Jos. V. Collins was to show how this proof may be shortened and simplified.

Professor G. J. Stokes, of Queen's College, Cork, Ireland, was prevented by sickness from finishing his paper on 'The Theory of Mathematical Inference.' The abstract of the incomplete paper indicates that the theory is advocated that the fundamental truths of mathematics are logical consequences of the mere fact or possibility of synthesis generally, and that ordinary mathematical inference is compounded of a logical or analytical element which has been reduced to mathematical form in Boole's Laws of Thought, and a synthetic element represented by Algebras of the type of Grassmann's *Ausdehnungslehre*.

A paper entitled ' Practical Astronomy during the First Half of the Present Century,' by Professor T. H. Safford, of Williamstown, Mass., unfortunately arrived too late to be read before the Section. It is a short and interesting account of the relations of the eminent astronomers Gauss, Bessel, the elder Struve and Airy to the astronomical progress made during the period stated.

Dr. G. A. Miller, of Cornell University, presented a short and interesting paper ' On the Commutators of a Group.' The following relations were brought out and commented upon by Dr. Miller : (1) If with a given group (G) commutators are formed with a fixed operator and all the operators of that group these commutators will generate a group which is transformed into itself by all the operators of the group G. (2) When the fixed operator transforms the

group G into itself the given commutators generate the smallest self-conjugate subgroup of G, which has the property that all the operators of the corresponding quotient group are commutative to the fixed operator. (3) If one of the elements of a commutator be multiplied on the left by each of the operators of a group it will be observed that the commutator remains unchanged when the multiplier is commutative to the other element, and that it is changed for every other multiplier. Hence this commutator has as many different values as the fixed element has conjugates when it is transformed by all the operators of the given group.

S. Kimura, of Japan, furnished a paper on 'Linear Vector Functions.'

One of the most interesting papers upon the program of Section A was 'The Determination of the Nature of Electricity and Magnetism,' by Professor R. A. Fessenden, of Western University, Allegheny, Pa. It was read before a joint session of Sections A and B, and will be reviewed in connection with the papers of Section B.

The fact that the American Mathematical Society was to hold a separate meeting at Columbus on Friday and Saturday of the Association week, and that the Conference of Astronomers and Astrophysicists is to be held at the Yerkes Observatory early in September, a date just late enough to make it inconvenient for persons who attended the Columbus meeting, both tended to reduce the length of program and the number in attendance at Section A. It is to be hoped that the organizations in question may in the future see fit to cooperate with Section A. It seems obvious that many benefits must accrue to each of the three organizations from such cooperation, for they have many common members and common interests.

JOHN F. HAYFORD,
Secretary of Section A.

ELEVENTH ANNUAL MEETING OF THE ASSOCIATION OF ECONOMIC ENTOMOLOGISTS, COLUMBUS, OHIO, AUGUST 18 AND 19, 1899.

THE Association met in room 4, Biological Hall, Ohio State University, at 10 a. m., August 18. Fourteen members and a number of distinguished visitors were present, the average attendance at the four sessions being about twenty. The address of the retiring President, Mr. C. L. Marlatt, Washington, D. C., on ' The Laissez-faire Philosophy applied to the Insect Problem ' was treated with an originality as courageous as refreshing. The author depicted the harmonious action of nature and called attention to her abundant powers of recuperation and self protection. The fundamental principles underlying the excessive multiplication and injury characterizing new or introduced species were explained, and an attempt was made to show the futility of efforts to prevent the introduction or secure the extermination of foreign insects once established in this country. These introductions of new forms are world movements not to be thwarted by man. The exploiting of short-lived or easily controllable ills was condemned and the unfair restrictions placed upon commerce by such efforts were pointed out. From the author's standpoint the only legitimate field for efforts in applied entomology is that of the local control of injurious species, and here the entomologist finds ample opportunity for the exercise of his powers in behalf of mankind. A general discussion of the address followed and while some of the members present were unable to accept entirely the conclusions of the author, all agreed that the address constituted a very important and valuable contribution to the philosophical literature of applied entomology.

Active members were elected as follows : C. S. Banks, Albany, N. Y.; Arthur Gibson, Ottawa, Canada ; H. P. Gould, Col-